gation, 1055 soundings were obtained, of which 355 are in depths greater than 1000 fathoms.

The object of the communication being merely to give a general description of the structural features of the basin of this great inland sea—the American Mediterranean—it is only necessary to mention here, that in connection with the soundings, temperatures were taken at various depths, and the organic life was explored by means of dredges. Everywhere below the depth of about 800 fathoms, the temperature was found to be between 39° and 40° F. The method of sounding was by the use of fine steel wire, indicated by Sir Wm. Thomson, with the mechanical appliances perfected by Commanders Belknap and Sigsbee of the U. S. Navy.

The exploration of the Gulf of Mexico was begun by the U. S. Coast Survey as long ago as 1846, when surveys of the shores were made, and soundings of the approaches were obtained under the Superintendency of Prof. A. D. Bache. These investigations continued until the outbreak of the civil war, Prof. Bache having in view from the earliest date of his work, the exploration of the Gulf Stream and its attendant phenomena, in addition to the surveys requisite for navigation. When after the close of the war the Coast Survey resumed its former activity, under the administration of Prof. Benjamin Peirce, the physical and biological investigations were continued; but it was not until the present Superintendent of the U. S. Coast Survey, (C. P. Patterson, LL.D.) organized a systematic Exploration of the whole Gulf, that its character became rightly understood. These explorations, begun in 1872 by Commander Howell, U. S. N., on the west coast of Florida in comparatively shallow water, were continued and brought to a successful conclusion by Commander Sigsbee, U. S. N., (1875-78) in the steamer "Blake," accompanied by Prof. A. Agassiz in charge of biological investigations. The methods of obtaining temperatures at great depths as well as of dredging have been described in the Coast Survey Reports for several years past, and more especially in a treatise by Commander Sigsbee recently published by the Coast Survey.

Turning now to our model or map, we perceive that the basin of the Gulf of Mexico is an oval connected with the general ocean-circulation by two outlets, the Yucatan Channel and the Florida Straits. The area of the entire Gulf, cutting it off by a line from Cape Florida to Havana, is 595,000 square miles. Supposing the depth of the Gulf to be reduced by 100 fathoms, a surface would be laid bare amounting to 208,000 square miles, or rather more than one third of the whole area, The distance of the 100 fathom line from the coast is about 6 miles, near Cape Florida; 120 miles along the west coast of Florida; at the South Pass of the Mississippi, it is only 10 miles; opposite the Louisiana and Texas boundary, it increases to 130 miles; at Vera Cruz it is 15 miles, and the Yucatan banks have about the same width as the Florida banks.

The following table shows the area covered by the trough of the Gulf of Mexico to the depths stated:

Depth.	Area.	Differences.
2,000 fathoms.....	55,000 square miles.....	
1,500 " 187,000	"	132,000
1,000 " 260,000	"	73,000
500 " 326,000	"	66,000
100 " 387,000	"	61,000
Coast line.....595,000	"	208,000

This table shows that the greatest slopes occur between the depths of 100 and 1500 fathoms. The maximum depth reached is at the foot of the Yucatan banks 2119 fathoms. From the 1500 fathom line on the northern side of the Gulf to the deepest water close to the Yucatan banks, say to the depth of 2000 fathoms, is a distance of 200 miles, which gives a slope of five-ninths to 200, and may be considered practically as a plane surface. The 2000 fathom area has received the name of "Sigsbee Deep," after its explorer. The Yucatan Channel with a depth of 1164 fathoms has a cross-section of 110 square miles while the Straits of Florida, in its shallowest part opposite Jubiter Inlet, with a depth of 344 fathoms has a cross-section of only 10 square miles.

A view of the model reveals at once some important facts which a study of the plan conveys but imperfectly to the mind, and which were unsuspected before the great exploration of the Gulf was completed.

Among the more striking features displayed by the model to which Mr. Hilgard called attention, were:

1. The great distance to which the general slope of the continent extends below the present sea level before steeper slopes are reached. The 100 fathom line represents very closely the general continental line. The *massifs* of the Peninsulas of Florida and Yucatan have more than twice their present apparent width.

2. Very steep slopes lead from this submerged continental plateau to an area as great as that of the State of Georgia at the enormous depth of over 12,000 feet. There are three ranges on the Florida and Yucatan slopes extending in the aggregate from five to six hundred miles, along which the descent from 500 to 1500 fathoms (or 6000 feet), is within a breadth of from six to fifteen miles. No such slopes and correspondingly elevated plateaus appear to occur on the un-submerged surface of the earth —the suggestion presents itself, that while the latter have suffered atmospheric erosion, those which we are considering have not sensibly changed from the positions assumed in the mechanical shaping of the earth's crust.

3. The far protrusion of the Mississipi Delta towards the deep water of the Gulf, seems to give evidence to the Engineer, of the probably permanent success of the Mississippi Jetties, as delivering the silt of the river into water of so great depth that but few extensions will ever become necessary. In connection with the same feature, the strong indentation to the westward of the present mouths of the Mississippi, indicating the probable site of the original fracture between the two slopes of the Mississipi Valley deserves attention.

4. In regard to the problem of general ocean circulation in connection with the Gulf Stream, the most important feature is the shallowness and small cross-section of the Straits of Florida between the Peninsular and Bahama banks, having at the shallowest part a cross-section of 11 square miles, with a greatest depth of 344 fathoms only. From observations published in the Coast Survey Reports the average northwardly current of the warm water through this Strait is probably not greater than 2 miles per hour—certainly not more than 2½ miles. It is evident, at once, that the warm water which so greatly modifies the climate of Western Europe, cannot all be supplied by the flow through this small channel. The concentration of the warm surface current from the Gulf of Mexico gives to this vein of the general circulation a marked velocity, which is not found in other portions of the Atlantic, and which, being perceptible to the navigator, has given its name of "Gulf Stream" to the whole system of the northeasterly surface-flow in the Atlantic Ocean. It is now necessary to assume that the so-called Gulf Stream is largely reinforced by a general northerly current from the outside of the West India Islands.

SCIENTIFIC SOCIETIES OF WASHINGTON.

THE BIOLOGICAL SOCIETY.—The Society met in the Smithsonian Institution, Friday evening, March 11th, President Gill in the Chair. The discussion was renewed upon Mr. True's paper respecting suctorial organs. Mr. Seaman spoke of certain plants, such as the American Woodbine, which seem to mimic the suctorial organs of animals. Professor Riley drew attention to the suctorial anal pseudopod of caterpillars, and Mr. Goode to the peculiar provision for prehension in

the marsupials. Dr. A. F. A. King read a paper on Septennial Periodicity, drawing attention to the phenomena of menstruation, œstration in animals, gestation, contagions, epidemics and climax of fevers. He was partially supported by Mr. Goode, who said that since the lunar month of four weeks had such an important bearing upon tides, etc., there is no absurdity in supposing that the same cause may have been at work through myriads of years to bring about periodicity as indicated in the paper. Professor Riley, Mr. Ward, the President, Dr. Prentiss, and others, took the opposite side of the question.

THE ANTHROPOLOGICAL SOCIETY.—Major J. W. Powell, the President, being in the Chair, the following papers were read: "Politico-Social Functions," Lester F. Ward; "The Savage Mind in the presence of Civilization," by Otis T. Mason. Mr. Ward first drew attention to the schism which ever manifests itself between theory and practice. Political philosophy taught in the schools is one thing, political rules and maxims of society are quite another. The speaker criticised the interpretation of the old legal school of politics as well as the modern naturalistic school. The latter, in holding that nature's fixed laws cannot be violated, forgot to include in nature the struggles of human reason. This is well exemplified in the anecdote concerning Plato. When about to flog a slave for stealing, the latter thought to get off by crying, "It is my fate to steal." The philosopher quickly reminded the slave that it was also his fate to get thrashed for his theft. The paper took the ground that Society was tending more and more to protection, and, from a large collection of statistics showed that gradually new interests were passing under control of the State. Major Powell warmly endorsed Mr. Ward's remarks, and affirmed that the conviction had been growing upon him in favor of the following view: Society begins with the kinship tie, passes on to the property basis of organization, and culminates in the evolution and protection of industries. Mr. Mason's paper was partly theoretical and partly practical. Under the first head it was maintained that the conflicts of the human family in all time had brought the different races of men face to face with higher and better methods, and from these much aid had been received in their own advancement. The practical portion of the paper related to the education of our Indians. The speaker had gone over the history of the subject, had corresponded with every respectable school and college in the country, and had collected the statistics of government operations from the Indian Bureau. The conclusion arrived at was that much had been wasted through ignorance of anthropological methods, and that the organization of a Bureau of Ethnology had been the wisest scheme the government had undertaken in this regard.

MICROSCOPY.

We have received from Dr. William Hailes, of the Pathological Laboratory, Albany Medical College, specimens of injected preparations cut with his improved microtome, which was figured and described on page 187, vol. 1, of "SCIENCE." The sections are from the kidney of the cat, and are very perfect, showing the excellence of his microtome and his own methods of manipulation. Dr. Hailes also sends us three photographs of magnified specimens of the Embryo of the Chick, taken, respectively 24, 36, and 72 hours after commencement of incubation. These photographs are highly interesting, and may be seen at our office by those pursuing such studies.

Messrs. Lennis and Duncker, both of Berlin, have published an interesting paper in the Zeitschrift für Mikroskopische Fleischschau on a new parasite with which they have met while performing their official duty. In examining pork for trichinæ they discovered a vermicular *diatomea* imbedded between the muscular fibres which they describe in the following terms: It is exceedingly thin and transparent, of a greyish color, and of about the size of the cyst-wall of a trichina.

Professor Leuckardt is inclined to consider its presence in the pork as accidental, and believes that it is of little importance to government inspectors of meat in their official work.

A WRITER in *Nature* makes the following observations on the minute structure of metals hammered into thin leaves which are quite instructive. Notwithstanding the great opacity of metals it is quite possible to procure, by chemical means, metallic leaves sufficiently thin to examine beneath the microscope by transmitted light. Such an examination will show two principal types of structure, one essentially granular and the other fibrous. The granular metals, of which tin may be taken as an example, present the appearance of exceedingly minute grains, each one being perfectly isolated from its neighbors by still smaller interspaces. The cohesion of such leaves is very small.

The fibrous metals, on the other hand, such as silver and gold, have a very marked structure. Silver, especially, has the appearance of a mass of fine, elongated fibres, which are matted and interlaced in a manner which very much resembles hair. In gold this fibrous structure, although present, is far less marked. The influence of extreme pressure upon gold or silver seems to be, therefore, to develop a definite internal structure. Gold and silver, in fact appear to behave in some respects like plastic bodies. When forced to spread out in the direction of least resistance their molecules do not move uniformly, but neighboring molecules, having different velocities, glide over one another, causing a pronounced arrangement of particles in straight lines.

A new edition of Messrs. Beck's catalogue corrected to the first of this month has been received. It is a work of 176 pages, well illustrated and appears to cover all the wants of a microscopist. Mr. W. H. Walmsley, the manager of the American branch of this house, informs us that there is a large demand for microscopes at this time, and that orders are in advance of their means of producing instruments. We notice some change in the prices and that the "Economic" has been raised to $40 including objectives. Messrs. Beck & Co. have been very successful in producing good models for their microscopes, and their workmanship is excellent. Both Mr. Beck and Mr. Walmsley are accomplished microscopists, and can thus anticipate the requirements of their customers.

ASTRONOMY.

VARIABLE STARS OF SHORT PERIOD.*

Under the above title, Professor Pickering has read before the American Academy of Arts and Sciences, the second of two papers, both of which are to be regarded as preliminary, rather than final discussions, upon the causes of variability in the light of fixed stars. In the preceding paper (Proc. Amer. Acad. XVI., 1.) the following classification of variables was made:

I. Temporary stars. Examples, Tycho Brahe's star of 1572, new star in Corona 1866.

II. Stars undergoing slight changes according to laws as yet unknown. Examples o Ceti and χ Cygni.

III. Stars whose light is continually varying, but the changes are repeated with great regularity in a period not exceeding a few days. Examples, β Lyrae and δ Cephei.

IV. Stars which every few days undergo for a few hours a remarkable diminution in light, this phenomenon

* Proceedings of the American Academy of Arts and Sciences, Vol. XVI.